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Photodynamic processes in Ce + Yb:CaF2 crystals investigation

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Abstract

Here the photochemical properties of CaF2 crystal doped by Ce3+ and Yb3+ ions under pumping with ultraviolet (UV) irradiation resonant to the Ce3+ ion interconfigurational 5d-4f transitions were studied and significant codoping effect on the crystal solarization suppression was observed. The photodynamic processes model occurring in the active medium and which taking into account the color center formation and processes of enhanced free charges recombination via valence change of variety of impurity centers was proposed. This model allows to explain both electronic and hole types color centers suppression in Ce:CaF2 sampels codoped by Yb3+ ions. It was shown that Yb3+ ions in the crystal act as centers of electron and hole recombination with probability dependent on the extra charge compensation type. Therefore the proposed antisolarant mechanism of the coactivation effect satisfactorily describes photochemical properties of fluorite and other crystal hosts.

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Keywords

Color centers, Ionization and reduction rare-earth ions, Photochemical properties, UV spectroscopy